$$\varphi_v = 0,64 + \varphi_F = 0,64 - \frac{\pi}{2}$$

$$v(t) = V_m \sin\left(20t + 0,64 - \frac{\pi}{2}\right) \quad \text{en } m.s^{-1}$$

$$x(t) = \frac{V_m}{\omega}\sin\left(20t + 0,64 - \frac{\pi}{2} - \frac{\pi}{2}\right)$$

$$x(t) = 0,01\sin(20t + 0,64 - \pi) \quad \text{en m}$$

3°)

* $T = -kx = -kX_m \sin(\omega t + \varphi_x)$

$T(t) = kX_m \sin(\omega t + \varphi_x + \pi)$

$T_{max} = kX_m = 1N$

* $f = -hv = -hV_m \sin(\omega t + \varphi_v)$

$f(t) = -hV_m \sin(\omega t + \varphi_v + \pi)$

$f_{max} = hV_m = 2,4x0,2 = 0,48N$

4°) $E_{consommée} = P.t = \frac{h.V_m^2}{2}t = \frac{2,4(0,2)^2}{2}.60 = 2,88J$

5°) V_m prend sa valeur maximale ⇒ résonance de vitesse

$$\omega = \omega_0 = \sqrt{\frac{k}{m}} \Rightarrow \omega^2 = \frac{k}{m} \Rightarrow m = \frac{k}{\omega^2} = \frac{100}{(20)^2} = 0,25kg$$

$m_0 = 250 - 160 = 90g$

$F_m = h.V_m$ et $\varphi_F = \varphi_v$

$$V_0 = \frac{F_m}{h} = \frac{0,6}{2,4} = 0,25m.s^{-1}$$

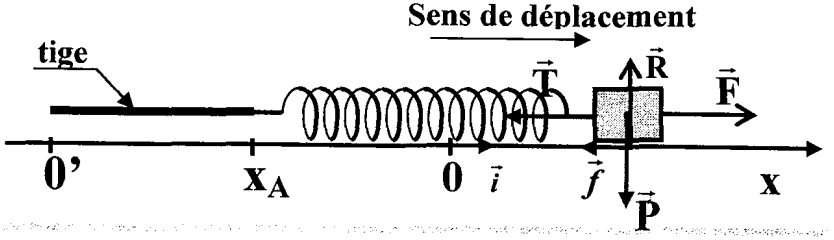
$F = F_m \sin(\omega t + \varphi_F)$

$f = -hv = -hV_m \sin(\omega_0 t + \varphi_v) = -F_m \sin(\omega_0 t + \varphi_F)$

d'où $\varphi_f = \varphi_F + \pi$ et $\|\vec{f}\| = \|\vec{F}\|$

• Seulement pour la résonance de vitesse, la force excitatrice compense totalement la force de frottement

$$\bullet\ Z = \frac{F_m}{V_m} = h = 2,4Kg.s^{-1}$$

Exercice N°5 :

1°)